

Student Name _____



**New Jersey Graduation
Proficiency Assessment
Mathematics Component**

*Practice Test
Large Print*

TEST BOOKLET SECURITY BARCODE



Unit 1

Directions:

Today you will take Unit 1 of the Mathematics component of the Graduation Proficiency Assessment. Unit 1 has two sections. In the first section, you may not use a calculator. In the second section, you may use a calculator. **You will not be allowed to return to the first section of the test after you start the calculator section.** You must complete both the non-calculator and calculator sections of Unit 1 within the time allowed.

Read each question. Then, follow the directions to answer each question. Circle the answer or answers you have chosen in your test booklet. If you need to change an answer, be sure to erase your first answer completely. If a question asks you to show or explain your work, you must do so to receive full credit. Only responses written within the provided space will be scored.

If you do not know the answer to a question, you may go on to the next question. When you finish the first section, you may review your answers and any questions you did not answer in this section ONLY. Once you have reviewed your answers, continue to the calculator section. When you are ready to go on to the calculator section, raise your hand to receive your calculator.

Directions for Completing the Answer Grids

1. Work the problem and find an answer.
2. Write your answer in the boxes at the top of the grid.
3. Print only one number or symbol in each box. Do not leave a blank box in the middle of an answer.
4. Fractions cannot be entered into an answer grid and will not be scored. Enter fractions as decimals.
5. See below for examples on how to correctly complete an answer grid.

EXAMPLES

To answer -3 in a question, fill in the answer grid as shown below.

-	3				
⊖					
	⊙	⊙	⊙	⊙	⊙

To answer $.75$ in a question, fill in the answer grid as shown below.

.	7	5			
⊖					
	⊙	⊙	⊙	⊙	⊙

GO ON TO NEXT PAGE

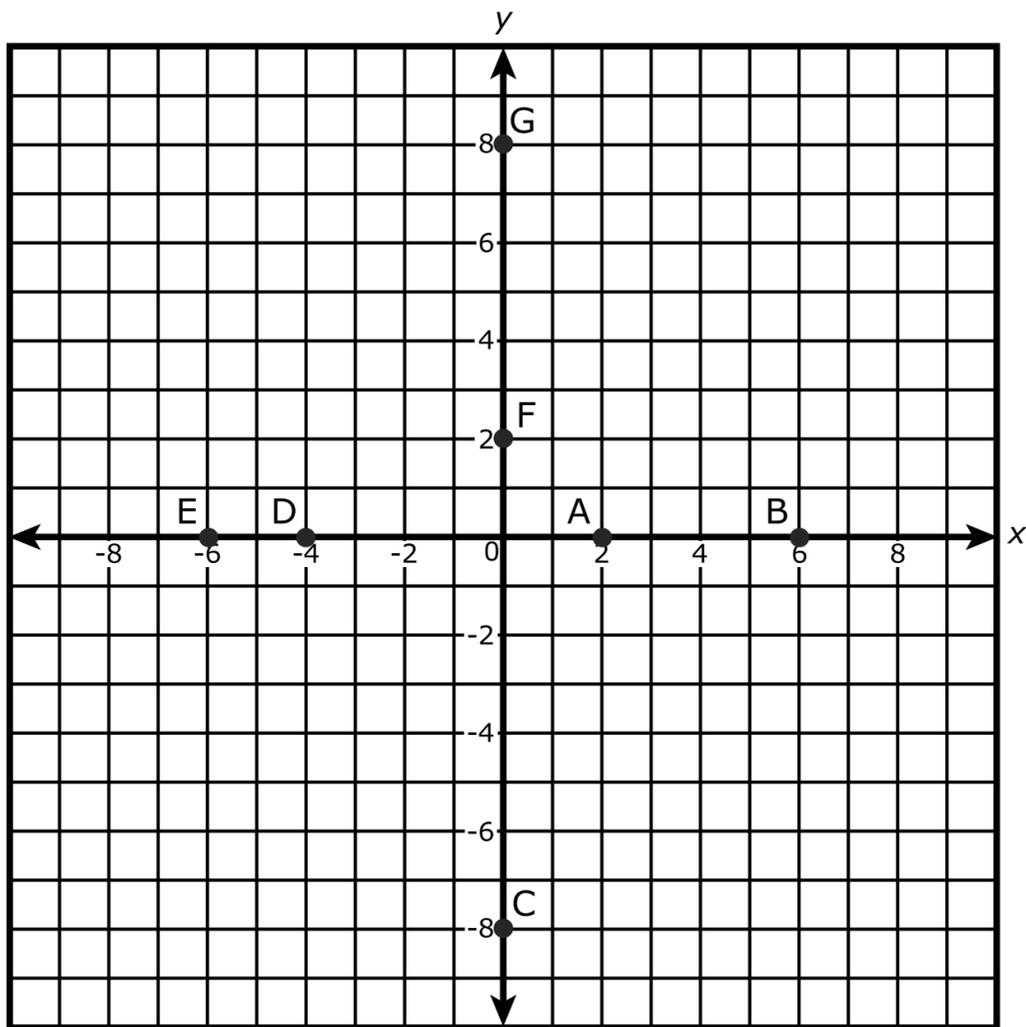
Unit 1 - Section 1 (Non-Calculator)

This unit has two sections: a non-calculator section and a calculator section.

You will now take the non-calculator section of this unit in which you may not use a calculator. You will not be allowed to return to the first section of the test after you start the calculator section. You must complete both sections within the time allowed for this unit.

Once you finish the non-calculator section, read the directions in your test booklet on how to continue.

1. Several points are plotted on the graph.



Which of the plotted points on the graph represent the zeros of the function $f(x) = (x^2 + 2x - 8)(x - 6)$? Select **all** that apply.

- A. (2, 0)
- B. (6, 0)
- C. (0, -8)
- D. (-4, 0)
- E. (-6, 0)
- F. (0, 2)
- G. (0, 8)

Use the information provided to answer Part A and Part B for question 2.

Let a represent a non-zero rational number and let b represent an irrational number.

2. Part A

Which expression could represent a rational number?

- A. $-b$
- B. $a + b$
- C. ab
- D. b^2

Part B

Consider a quadratic equation with integer coefficients and two distinct zeros. If one zero is irrational, which statement is true about the other zero?

- A. The other zero must be rational.
- B. The other zero must be irrational.
- C. The other zero can be either rational or irrational.
- D. The other zero must be non-real.

3. Which factorization can be used to reveal the zeros of the function $f(n) = -12n^2 - 11n + 15$?

A. $f(n) = -n(12n + 11) + 15$

B. $f(n) = (-4n + 3)(3n + 5)$

C. $f(n) = -(4n + 3)(3n + 5)$

D. $f(n) = (4n + 3)(-3n + 5)$

4. Which expression is equivalent to $(3x^5 + 8x^3) - (7x^2 - 6x^3)$?

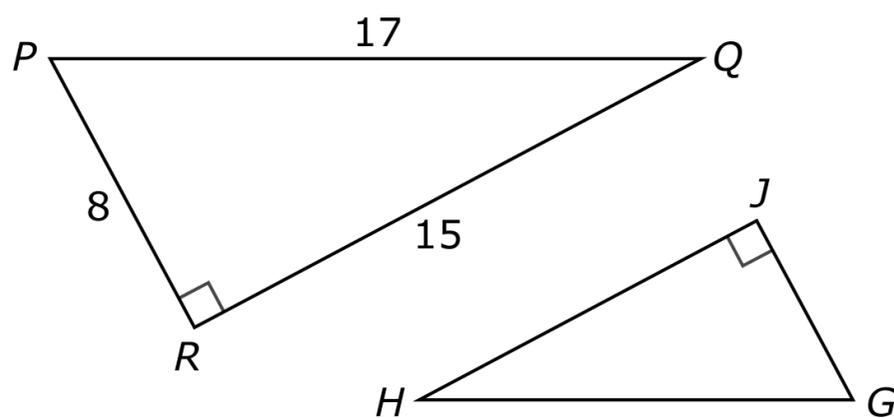
A. $-4x^3 + 14$

B. $-4x^5 + 14x^3$

C. $3x^5 + 14x^3 - 7x^2$

D. $3x^5 + 2x^3 - 7x^2$

5. In this figure, triangle GHJ is similar to triangle PQR .

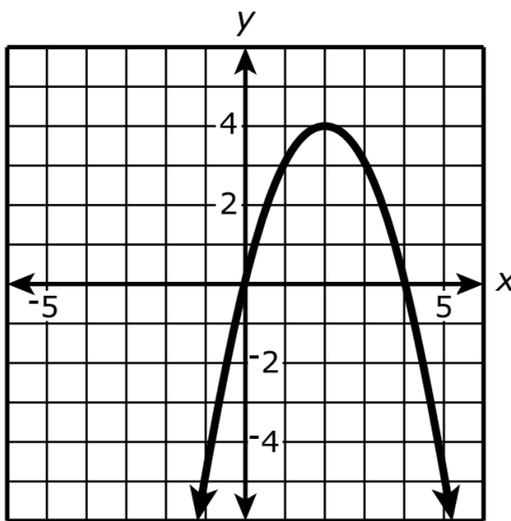


Based on this information, which ratio represents $\tan H$?

- A. $\frac{8}{15}$
- B. $\frac{8}{17}$
- C. $\frac{15}{8}$
- D. $\frac{17}{8}$

Use the information provided to answer Part A and Part B for question 6.

The function $f(x) = 4x - x^2$ is graphed in the xy -coordinate plane as shown.



6. Part A

Based on the graph of the function, which statements are true?

Select **all** that apply.

- A.** f is increasing on the interval $x < 0$.
- B.** f is decreasing on the interval $x < 0$.
- C.** f is increasing on the interval $0 < x < 2$.
- D.** f is decreasing on the interval $0 < x < 2$.
- E.** f is increasing on the interval $2 < x < 4$.
- F.** f is decreasing on the interval $2 < x < 4$.
- G.** f is increasing on the interval $x > 4$.
- H.** f is decreasing on the interval $x > 4$.

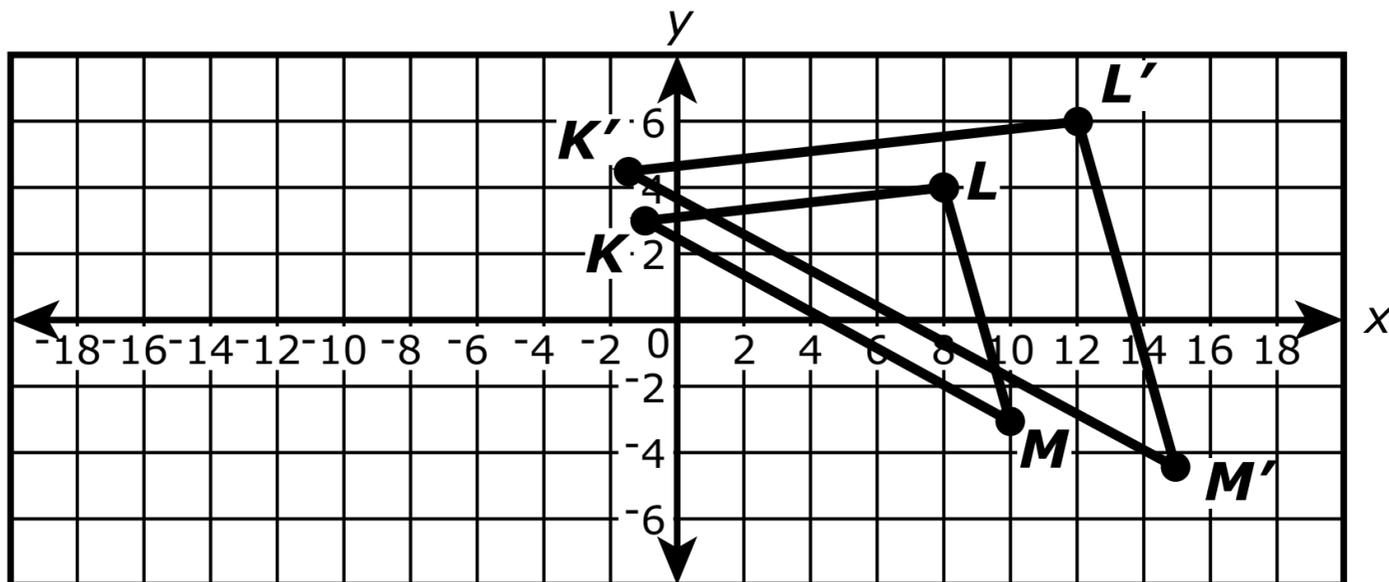
Part B

Based on the graph of the function, which statements are true?

Select **all** that apply.

- A.** $f(x) < 0$ on the interval $x < 0$.
- B.** $f(x) > 0$ on the interval $x < 0$.
- C.** $f(x) < 0$ on the interval $0 < x < 2$.
- D.** $f(x) > 0$ on the interval $0 < x < 2$.
- E.** $f(x) < 0$ on the interval $2 < x < 4$.
- F.** $f(x) > 0$ on the interval $2 < x < 4$.
- G.** $f(x) < 0$ on the interval $x > 4$.
- H.** $f(x) > 0$ on the interval $x > 4$.

7. Triangle KLM is the pre-image of $\triangle K'L'M'$, before a transformation. Determine if these two figures are similar.



Which statements are true?

Select **all** that apply.

- A. Triangle KLM is similar to $\triangle K'L'M'$.
- B. Triangle KLM is not similar to $\triangle K'L'M'$.
- C. There was a dilation of scale factor 0.5 centered at the origin.
- D. There was a dilation of scale factor 1 centered at the origin.
- E. There was a dilation of scale factor 1.5 centered at the origin.
- F. There was a translation left 0.5 and up 1.5.
- G. There was a translation left 1.5 and up 0.5.



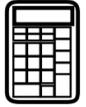


You have come to the end of the non-calculator section in Unit 1 of the test.

- **You may review your answers in the non-calculator section ONLY. You will not be allowed to return to the non-calculator section once you have received your calculator.**
- **When you are ready to go on to the calculator section, raise your hand to receive your calculator.**

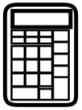


**Go on to
Unit 1 - Section 2
(Calculator)**



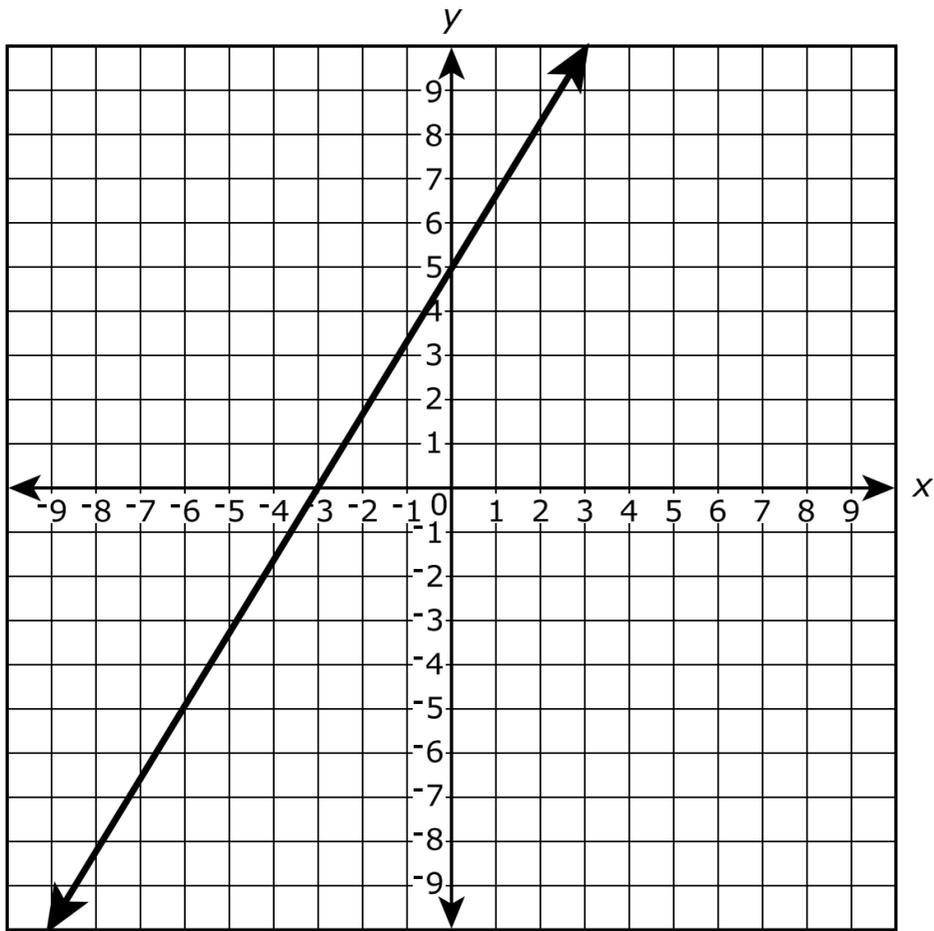
Unit 1 - Section 2 (Calculator)

Once you have received your calculator, continue into the calculator section.

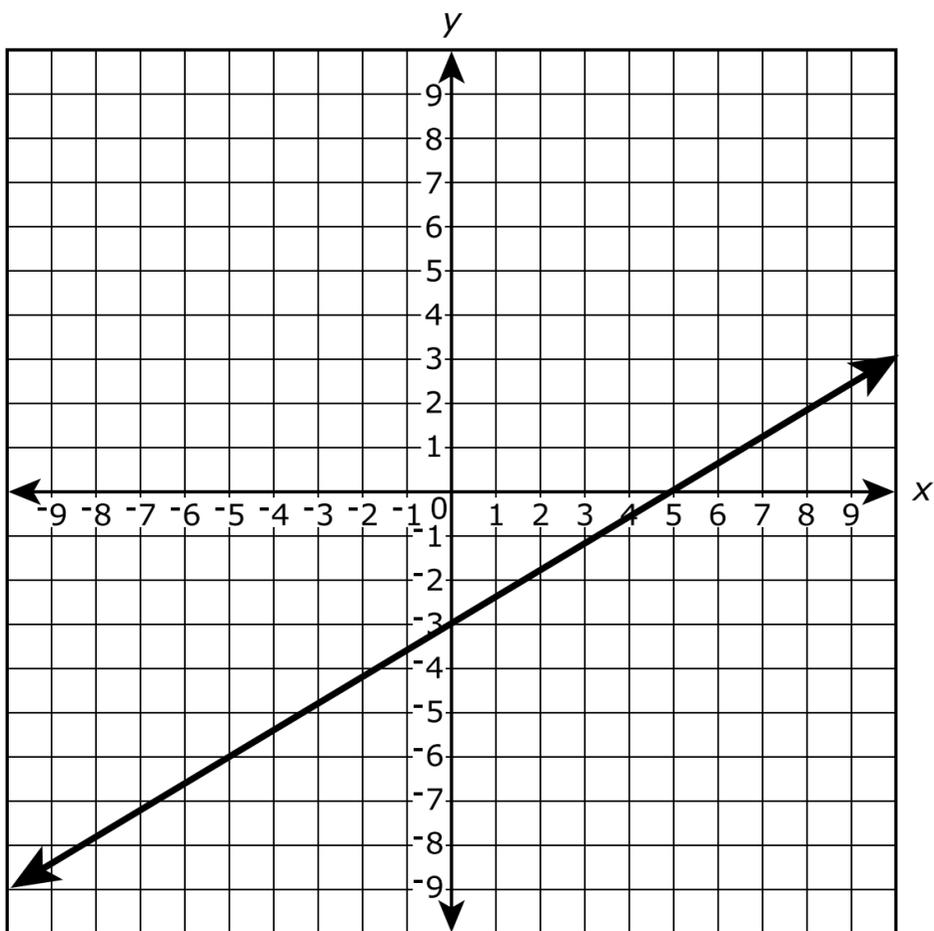


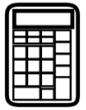
8. Which graph represents the equation $5y - 3x = -15$?

A.

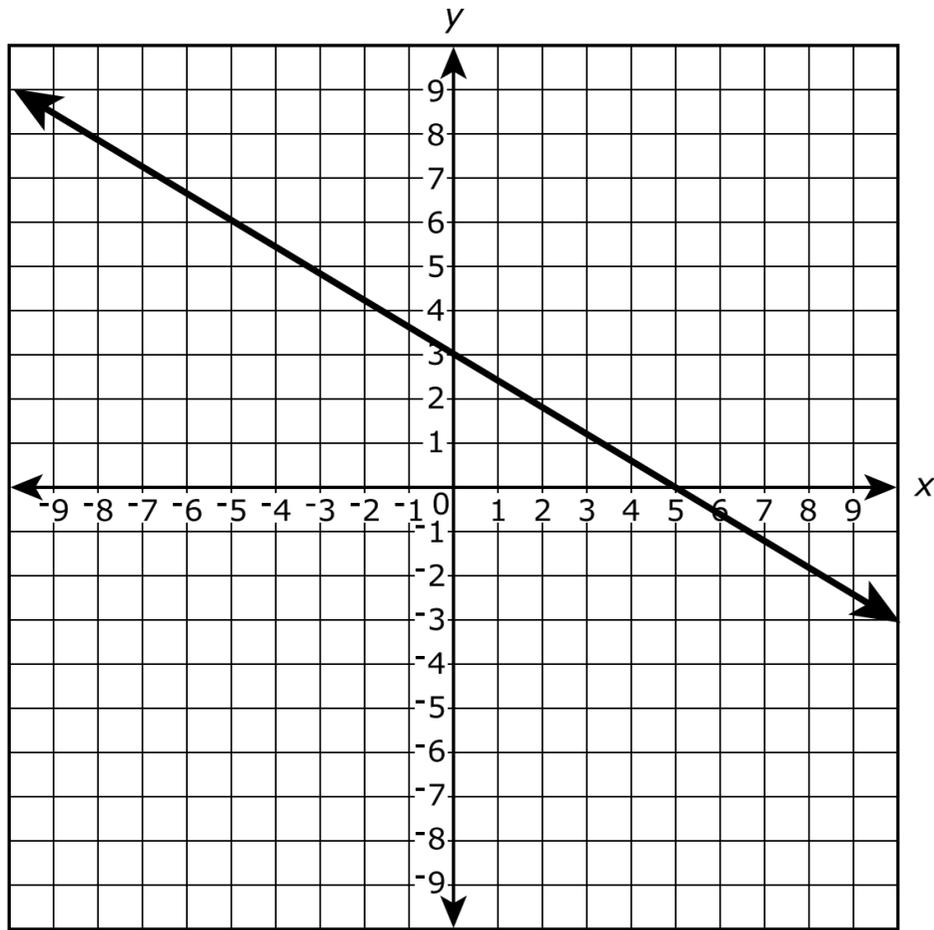


B.

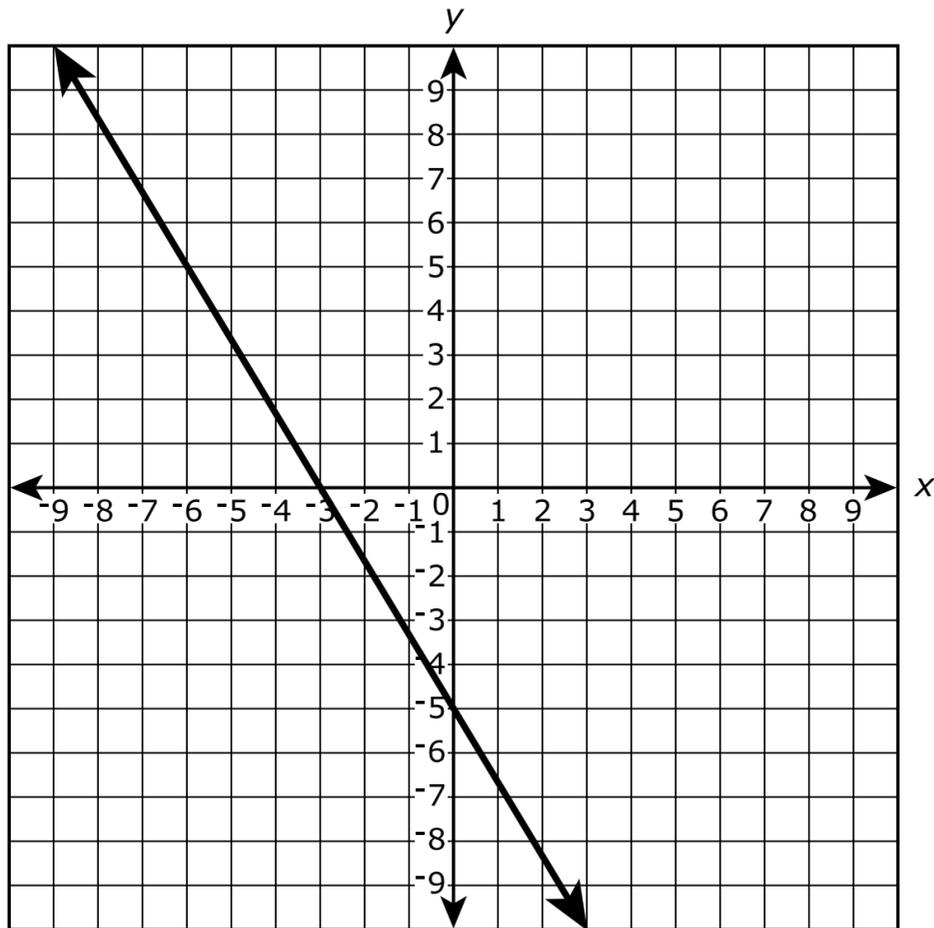




C.



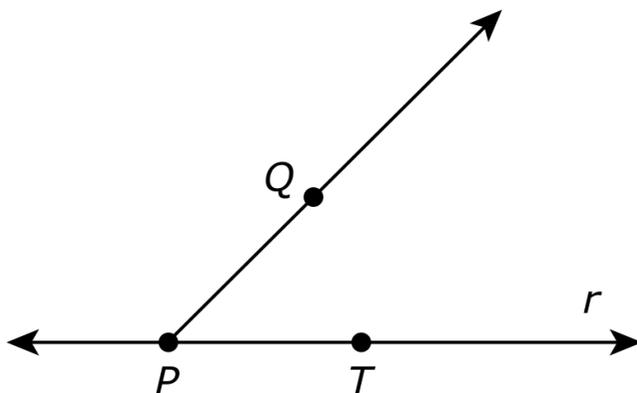
D.



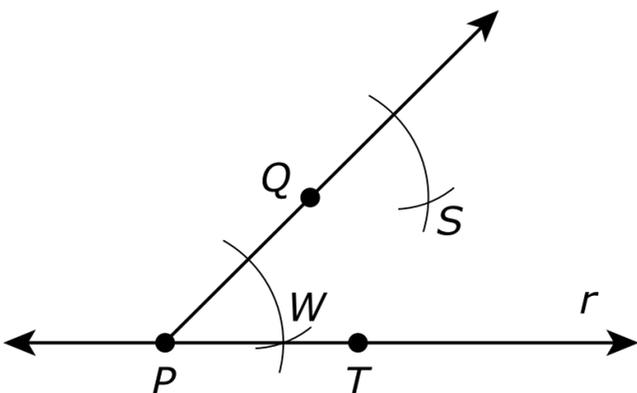


Use the information provided to answer Part A and Part B for question 9.

The figure shows line r , points P and T on line r , and point Q not on line r . Also shown is ray PQ .

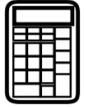


9. Part A



Consider the partial construction of a line parallel to r through point Q . What would be the final step in the construction?

- A. draw a line through P and S
- B. draw a line through Q and S
- C. draw a line through T and S
- D. draw a line through W and S

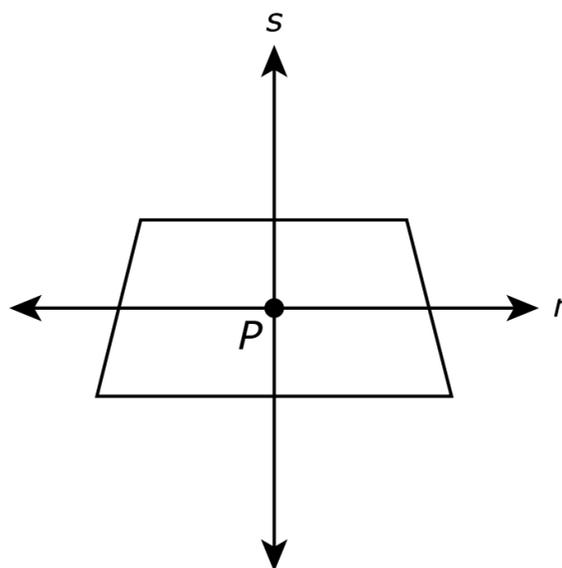
**Part B**

Once the construction is complete, which of the reasons listed contribute to proving the validity of the construction?

- A.** When two lines are cut by a transversal and the corresponding angles are congruent, the lines are parallel.
- B.** When two lines are cut by a transversal and the vertical angles are congruent, the lines are parallel.
- C.** definition of segment bisector
- D.** definition of an angle bisector



10. The figure shows two perpendicular lines, s and r , intersecting at point P in the interior of a trapezoid. Line r is parallel to the bases and bisects both legs of the trapezoid. Line s bisects both bases of the trapezoid.



Which transformation will always carry the figure onto itself?

Select **all** that apply.

- A. a reflection across line r
- B. a reflection across line s
- C. a rotation of 90° clockwise about point P
- D. a rotation of 180° clockwise about point P
- E. a rotation of 270° clockwise about point P



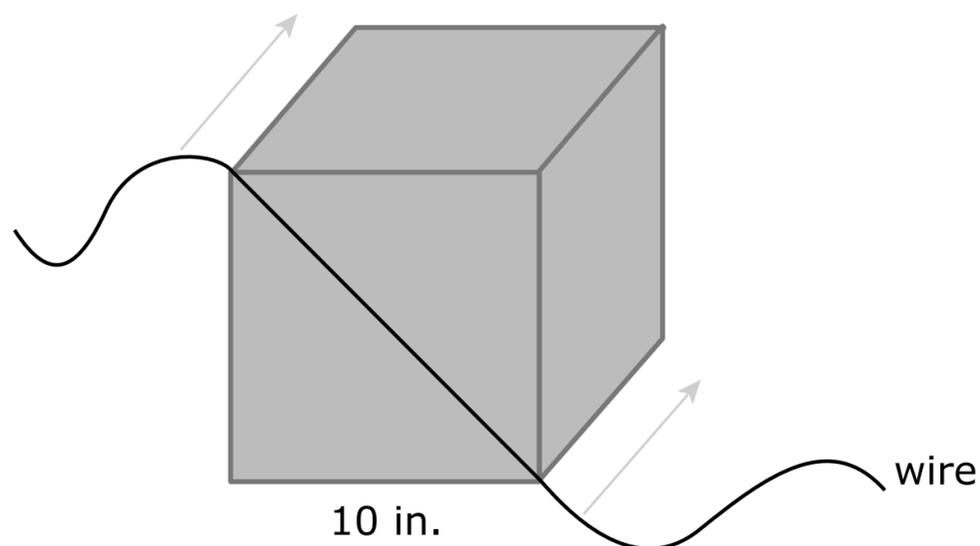
GO ON TO NEXT PAGE



11. Part A

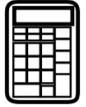
Daniel buys a block of clay for an art project. The block is shaped like a cube with edge lengths of 10 inches.

Daniel decides to cut the block of clay into two pieces. He places a wire across the diagonal of one face of the cube, as shown in the figure. Then he pulls the wire straight back to create two congruent chunks of clay.



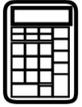
Daniel wants to keep one chunk of the clay for later use. To keep that chunk from drying out, he wants to place a piece of plastic sheeting on the surface he exposed when he cut through the cube. Describe this newly exposed two-dimensional cross section, and find its area. Round your answer to the nearest whole square inch. Show your work.

Enter your answers and your work in the space provided.



11. Part A

A large, empty rectangular box with a black border, intended for the student to show their work for this problem.

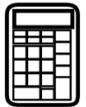


Part B

Daniel wants to reshape the other chunk of clay to make a set of clay spheres. He wants each sphere to have a diameter of 4 inches. Find the maximum number of spheres that Daniel can make from the chunk of clay. Show your work.

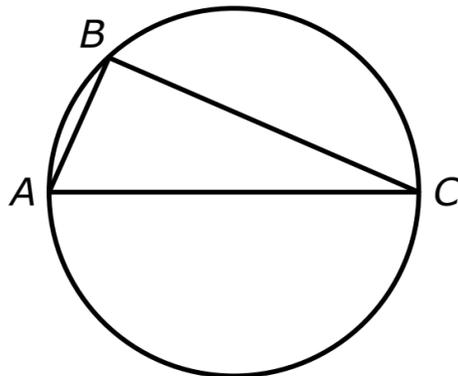
Enter your answer and your work in the space provided.

11. Part B



Use the information provided to answer Part A and Part B for question 12.

The figure shows triangle ABC inscribed in a circle.



\overline{AC} is a diameter of the circle.

$AB = 12$ inches, and $BC = 28$ inches.

12. Part A

What is the measure of angle A , to the nearest tenth of a degree?

Enter your answer in the box.

⊖							
	⊙	⊙	⊙	⊙	⊙	⊙	⊙

Part B

What is the perimeter of triangle ABC , to the nearest tenth of an inch?

Enter your answer in the box.

⊖							
	⊙	⊙	⊙	⊙	⊙	⊙	⊙



- 13.** Let $|x| + |y| = c$ where, c is a real number.

Determine the number of points that would be on the graph of the equation for **each** given case:

Case 1: $c < 0$

Case 2: $c = 0$

Case 3: $c > 0$

Justify your answers.

Enter your answers and justifications in the space provided.



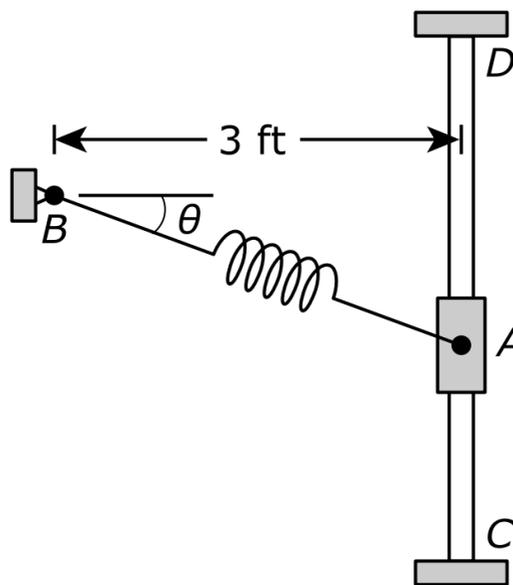
13.

A large, empty rectangular box with a black border, intended for the student to show their work for question 13.



Use the information provided to answer Part A and Part B for question 14.

A spring is attached at one end to support B and at the other end to collar A , as represented in the figure. Collar A slides along the vertical bar between points C and D . In the figure, the angle θ is the angle created as the collar moves between points C and D .



14. Part A

When $\theta = 28^\circ$, what is the distance from point A to point B to the nearest tenth of a foot?

Enter your answer in the box.

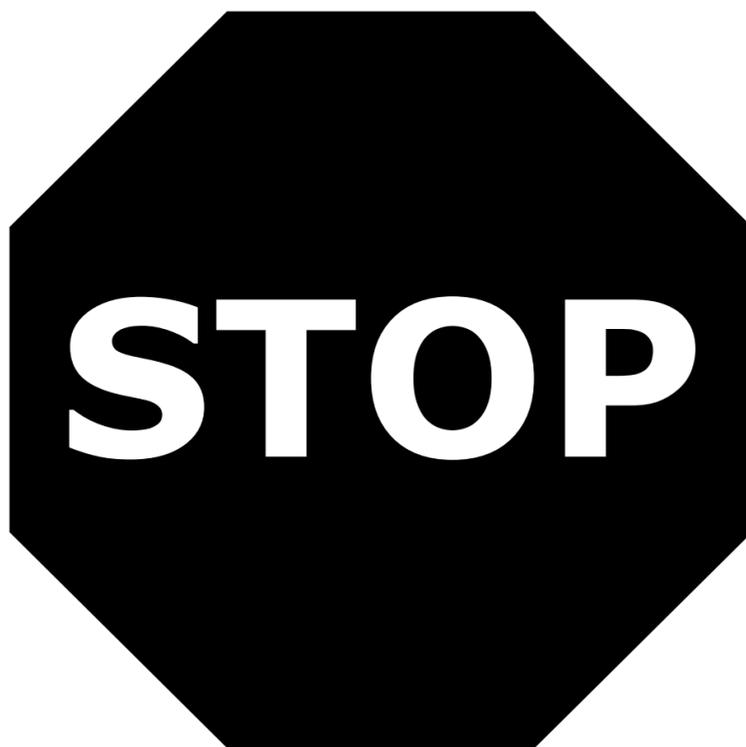
⊖					
●	●	●	●	●	●

**Part B**

When the spring is stretched and the distance from point A to point B is 5.2 feet, what is the value of θ to the nearest tenth of a degree?

- A.** 35.2°
- B.** 45.1°
- C.** 54.8°
- D.** 60.0°

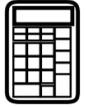




You have come to the end of the calculator section in Unit 1 of the test.

- **Review your answers in the calculator section of Unit 1 only.**
- **Then, close your test booklet and raise your hand to turn in your test materials.**







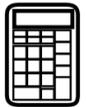
Unit 2 (Calculator)

Directions:

Today you will take Unit 2 of the Mathematics component of the Graduation Proficiency Assessment. You will be able to use a calculator.

Read each question. Then, follow the directions to answer each question. Circle the answer or answers you have chosen in your test booklet. If you need to change an answer, be sure to erase your first answer completely. If a question asks you to show or explain your work, you must do so to receive full credit. Only responses written within the provided space will be scored.

If you do not know the answer to a question, you may go on to the next question. If you finish early, you may review your answers and any questions you did not answer in this unit ONLY. Do not go past the stop sign.



Directions for Completing the Answer Grids

1. Work the problem and find an answer.
2. Write your answer in the boxes at the top of the grid.
3. Print only one number or symbol in each box. Do not leave a blank box in the middle of an answer.
4. Fractions cannot be entered into an answer grid and will not be scored. Enter fractions as decimals.
5. See below for examples on how to correctly complete an answer grid.

Unit 2

EXAMPLES

To answer -3 in a question, fill in the answer grid as shown below.

-	3					
⊖						
●	●	●	●	●	●	●

To answer $.75$ in a question, fill in the answer grid as shown below.

	.	7	5			
⊖						
●	●	●	●	●	●	●



15.

Elephant Population Estimates—Namibia

Combined estimates for Etosha National Park and the Northwestern Population

Year	Base Year	Estimated Number of Elephants
1998	3	3,218
2000	5	3,628
2002	7	3,721
2004	9	3,571

The elephant population in northwestern Namibia and Etosha National Park can be predicted by the expression $2,649(1.045)^b$, where b is the number of years since 1995.

What does the value 2,649 represent?

- A. the predicted increase in the number of elephants in the region each year
- B. the predicted number of elephants in the region in 1995
- C. the year when the elephant population is predicted to stop increasing
- D. the percentage the elephant population is predicted to increase each year



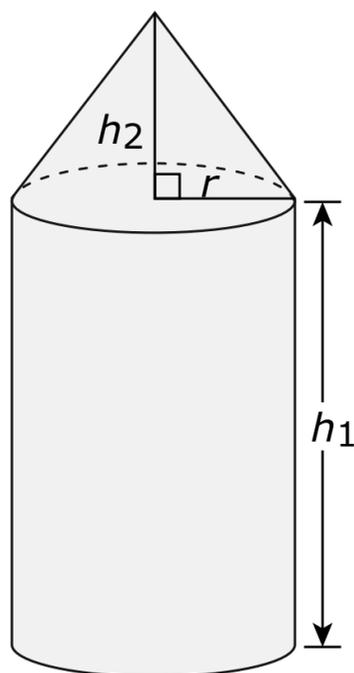
16. Find the equation that is equivalent to the quadratic equation shown.

$$x^2 - 6x - 27 = 0$$

- A.** $x(x - 3) = 27$
- B.** $(x - 6)^2 = 63$
- C.** $(x - 3)^2 = 36$
- D.** $(x - 3)^2 = 28$



17. The Farmer Supply is building a storage building for fertilizer that has a cylindrical base and a cone-shaped top. The county laws say that the storage building must have a maximum width of 8 feet and a maximum height of 14 feet.



Dump trucks deliver fertilizer in loads that are 4 feet tall, 6 feet wide, and 12 feet long. Farmer Supply wants to be able to store 2 dump-truck loads of fertilizer.

Determine a height of the cylinder, h_1 , and a height of the cone, h_2 , that Farmer Supply should use in the design. Show that your design will be able to store at least two dump-truck loads of fertilizer.

Enter your answer and your work in the space provided.



17.

A large, empty rectangular box with a black border, intended for the student to show their work for question 17.

Unit 2



Use the information provided to answer Part A and Part B for question 18.

The area, A , in square feet, of a rectangular storage bin in a warehouse is given by the function $A(x) = -2x^2 + 36x$, where x is the width, in feet, of the storage bin.

18. Part A

If the function is graphed in a coordinate plane, which statement would be true?

- A.** The x -intercepts of the function are 0 and 8, which are a lower bound and an upper bound for the possible values of the length of the storage bin.
- B.** The x -intercepts of the function are 0 and 8, which are a lower bound and an upper bound for the possible values of the width of the storage bin.
- C.** The x -intercepts of the function are 0 and 18, which are a lower bound and an upper bound for the possible values of the length of the storage bin.
- D.** The x -intercepts of the function are 0 and 18, which are a lower bound and an upper bound for the possible values of the width of the storage bin.



Part B

The process of completing the square can be used to calculate the width, in feet, of the storage bin that gives a maximum area. What is the missing value?

$$A = -2x^2 + 36x$$

$$A = -2(x - 9)^2 + ?$$

Enter your answer in the box.

-							
	○	○	○	○	○	○	○



19. Which points are on the graph of the equation $-3x + 6y + 5 = -7$?

Select **all** that apply.

A. $(-3, 6)$

B. $(-2, 0)$

C. $(0, -2)$

D. $(6, -3)$

E. $(8, 2)$



- 20.** At the beginning of an experiment, the number of bacteria in a colony was counted at time $t = 0$. The number of bacteria in the colony t minutes after the initial count is modeled by the function $b(t) = 4(2)^t$. Which value and unit represent the average rate of change in the number of bacteria for the first 5 minutes of the experiment?

Select **all** that apply.

- A.** 24.0
- B.** 24.8
- C.** 25.4
- D.** 25.6
- E.** bacteria
- F.** minutes
- G.** bacteria per minute
- H.** minutes per bacteria



Use the information provided to answer Part A through Part C for question 21.

Consider the three points $(-4, -3)$, $(20, 15)$, and $(48, 36)$.

21. Part A

Which points are on the same line that passes through $(-4, -3)$, $(20, 15)$, and $(48, 36)$?

Select **all** that apply.

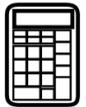
A. $(-8, -6)$

B. $(-2, -1)$

C. $(0, 0)$

D. $(4, 3)$

E. $(6, 8)$

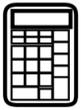
**Part B**

Use the information from Part A to explain why the ratio of the y -coordinate to the x -coordinate is the same for any point on the line except the y -intercept.

Explain why this is not true for the y -intercept.

Enter your explanations in the space provided.

21. Part B

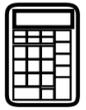


Part C

Do the points on the line $y = 3x - 2$ have a constant ratio of the y -coordinate to the x -coordinate for any point on the line except the y -intercept? Explain your answer.

Enter your answer and your explanation in the space provided.

21. Part C



22. Caroline knows the height and the required volume of a cone-shaped vase she's designing. Which formula can she use to determine the radius of the vase?

A. $r = \sqrt{\frac{V}{3\pi h}}$

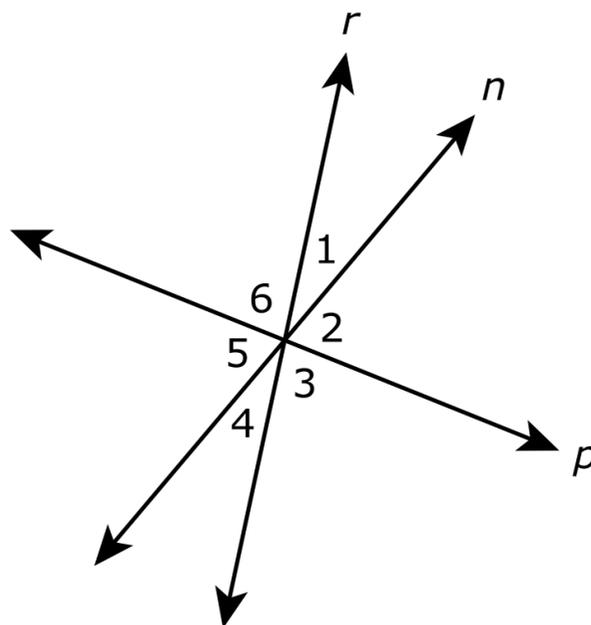
B. $r = \sqrt{\frac{3V}{\pi h}}$

C. $r = \frac{\sqrt{3V}}{\pi h}$

D. $r = \pm\sqrt{\frac{3V}{\pi h}}$



23. The figure shows lines r , n , and p intersecting to form angles numbered 1, 2, 3, 4, 5, and 6. All three lines lie in the same plane.



not to scale

Based on the figure, which of the individual statements would provide enough information to conclude that line r is perpendicular to line p ?

Select **all** that apply.

- A. $m\angle 2 = 90^\circ$
- B. $m\angle 6 = 90^\circ$
- C. $m\angle 3 = m\angle 6$
- D. $m\angle 1 + m\angle 6 = 90^\circ$
- E. $m\angle 3 + m\angle 4 = 90^\circ$
- F. $m\angle 4 + m\angle 5 = 90^\circ$



- 24.** A certain type of lily plant is growing in a pond in such a way that the number of plants is growing exponentially. The number of plants, N , in the pond at time t is modeled by the function $N(t) = ab^t$, where a and b are constants and t is measured in months. The table shows two values of the function.

t	$N(t)$
0	150
1	450

Which equation can be used to find the number of plants in the pond at time t ?

- A.** $N(t) = 150(1)^t$
- B.** $N(t) = 450(1)^t$
- C.** $N(t) = 150(3)^t$
- D.** $N(t) = 450(3)^t$

**Mathematics**

25. The table shows the approximate measurements of the Great Pyramid of Giza in Egypt and the Pyramid of Kukulcan in Mexico.

Pyramid	Height (meters)	Area of Base (square meters)
Great Pyramid of Giza	147	52,900
Pyramid of Kukulcan	30	3,025

Approximately what is the difference between the volume of the Great Pyramid of Giza and the volume of the Pyramid of Kukulcan?

- A. 1,945,000 cubic meters
- B. 2,562,000 cubic meters
- C. 5,835,000 cubic meters
- D. 7,686,000 cubic meters



GO ON TO NEXT PAGE

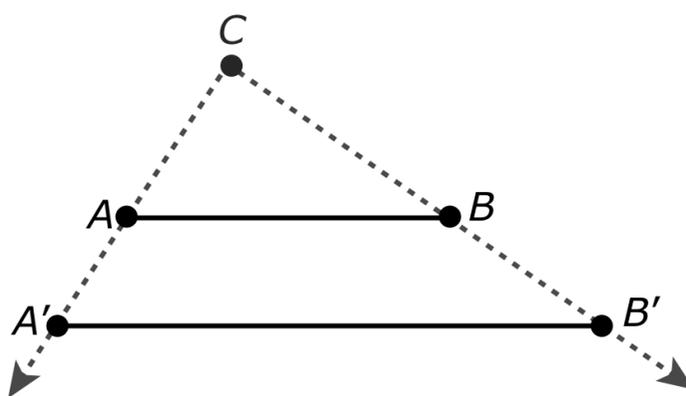


26. A dilation centered at point C with a scale factor of k , where $k > 0$, can be defined as follows:

1. The image of point C is itself. That is, $C' = C$.
2. For any point P other than C , the point P' is on \overrightarrow{CP} , and $CP' = k \cdot CP$.

Use this definition and the diagram shown to prove the following theorem:

If $\overline{A'B'}$ is the image of \overline{AB} after a dilation centered at point C with a scale factor of k , where $k > 0$, then $A'B' = k \cdot AB$.



Be sure to explain how you would use the diagram to prove the theorem, and show justifications for each statement in the proof.

Enter your proof, your explanation, and your justifications in the space provided.



26.

A large, empty rectangular box with a black border, intended for the student to show their work for question 26.

Unit 2



Use the information provided to answer Part A and Part B for question 27.

The Water Watch program is encouraging customers to reduce the amount of water they use each day. The program is selling low-flow showerheads, which use 2 gallons of water per minute, for \$54.00 each.

A family currently has a showerhead that uses 5 gallons of water per minute and is considering replacing it with one of the low-flow showerheads. The family uses the shower an average of 20 minutes per day and pays \$0.002 per gallon of water.

27. Part A

Create a model that can be used to determine the cost savings, in dollars, for the family to purchase and use a low-flow showerhead in terms of the number of days.

Then determine the number of days at which the family will start saving money. Justify your answer in terms of the context.

Enter your model, answer, and justification in the space provided.

27. Part A

**Part B**

One year after the low-flow showerhead is purchased, the cost of water increases by 5%. Create a new model to determine the cost savings, in dollars, with the increase in the cost of water.

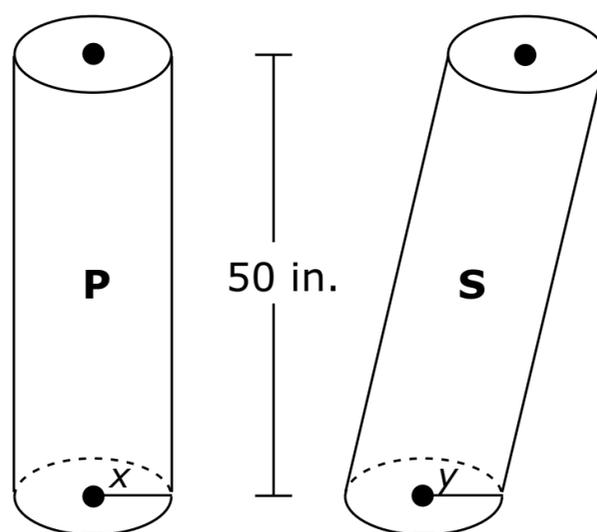
Use your model to determine the number of days at which the family will start saving money after the increase in the cost of water. Justify your answer.

Enter your model, answer, and justification in the space provided.

27. Part B



28. Two cylinders each with a height of 50 inches are shown.



Which statements about cylinders P and S are true?

Select **all** that apply.

- A. If $x = y$, the volume of cylinder P is greater than the volume of cylinder S, because cylinder P is a right cylinder.
- B. If $x = y$, the volume of cylinder P is equal to the volume of cylinder S, because the cylinders are the same height.
- C. If $x = y$, the volume of cylinder P is less than the volume of cylinder S, because cylinder S is slanted.
- D. If $x < y$, the area of a horizontal cross section of cylinder P is greater than the area of a horizontal cross section of cylinder S.
- E. If $x < y$, the area of a horizontal cross section of cylinder P is equal to the area of a horizontal cross section of cylinder S.
- F. If $x < y$, the area of a horizontal cross section of cylinder P is less than the area of a horizontal cross section of cylinder S.

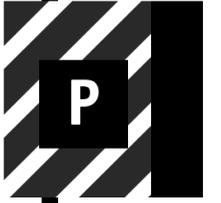




You have come to the end of Unit 2 of the test.

- **Review your answers from Unit 2 only.**
- **Then, close your test booklet and raise your hand to turn in your test materials.**





NEW JERSEY GRADUATION PROFICIENCY ASSESSMENT

